

# Evaluation of the resulting quality level index for interregional passenger automobile transport

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**Abstract.** In order to improve transport services for the population, it is necessary to study and analyze the information on the quality of transport services on the basis of gained experience and wishes of the passengers. This paper, basing on the normative and technical documentation and expert assessments, provides the rationale for the selection of quality indicators for interregional passenger automobile transport. Quality evaluation indexes are supposed to be simple for calculation and use; quality indexes are supposed to be formed in the way to judge the participation of carriers in the improvement of the quality of the transport process, i. e. to separate the qualities, which depend and do not depend on their activities. Indexes, developed on the basis of the standards' requirements are used in this paper. Such approach in the management of interregional passenger transport can contribute to the quality improvement of interregional automobile transport services provided to the population. The results of statistical data processing of passengers' questionnaires are also given here. The transport quality indexes were quantified through the passengers' answers ranking, the evaluation of the interregional passenger automobile transport quality was carried out on the example of the Ulyanovsk State Technical University.

## 1. Introduction

A whole range of related measures are aimed at improving the quality of interregional passenger automobile transport. To elaborate such measures, it is necessary to study and analyze information on the quality of transport services founded on gained experience and satisfaction of passengers.

Transport activity depends mainly on the consumer's demand for its services, but the consumer is not concerned with the carriers' financial expenses of the service. A passenger is willing to bear certain costs only under the conditions: minimum trip time, 100 % assurance of trip, safety and convenience of trip, ability of getting reliable trip information, convenient location of bus stations, etc. [1, 2]

The aim of the research is improving of the interregional passenger transport quality by developing methodological bases of customer satisfaction assessing with the quality of transport services.

The main goal is to stabilize the situation on the market of passenger regular transport on interregional routes. The solution to the problem on the routes will be the elaboration of a holistic management system, which is oriented towards the population, to meet their needs qualitatively, and to reduce the socially necessary transport costs.

At present, there is a quite stable system in the market of interregional passenger automobile transportation, which work has not only positive but also negative aspects.



One of the main problems is that the quality of transportations in the interregional communication is not controlled by regional bodies. Regulatory acts developed in the region don't possess legal force for interregional transport. The analysis of existing standards indicates a significant overlap of requirements for work in interregional transport [3–5], including quality assurance. This leads to increasing complexity and obfuscating of movement management process.

Applying standards-based indexes, can significantly improve the quality of services provided to the population by interregional transport management.

The development and implementation of an integrated system of passenger transport quality management in interregional communication include a methodology for assessing passenger satisfaction.

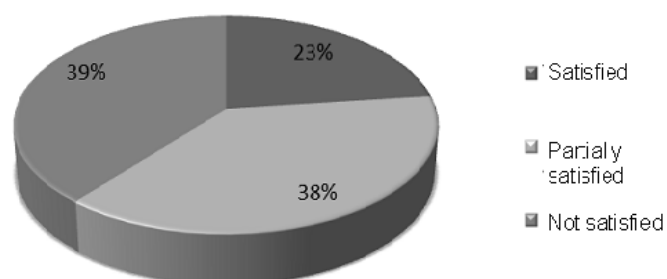
## 2. Methods and results

According to the methodology of assessing the satisfaction of passengers, an important stage is the questionnaire of passengers [6–8]. For this purpose we developed a special questionnaire for passenger interviews containing 40 questions. The content of the questionnaire reflects the essence of the transport services quality parameters.

728 people of different ages, social status, using the services of interregional passenger automobile transport in the Ulyanovsk region were interviewed. Questionnaires were conducted at bus stations of municipalities of the Ulyanovsk region, enterprises and organizations, educational institutions, social protection institutions (people of retirement age) and, of course, in public automobile transport itself.

Here is a number of results of the survey responses [9].

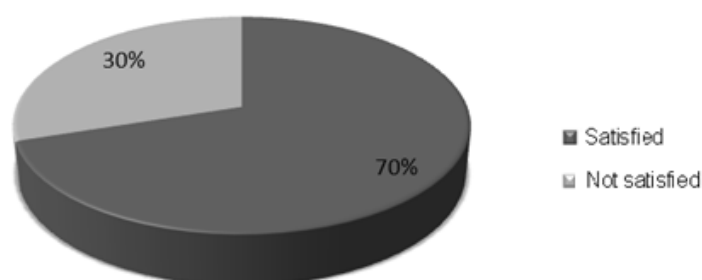
According to the results of the questionnaire, 23 % of passengers were satisfied with the level of comfort of interregional automobile transport, 38 % were partially satisfied and 39 % were not satisfied (Figure 1).



**Figure 1.** Satisfaction of passengers with the level of transportation comfort.

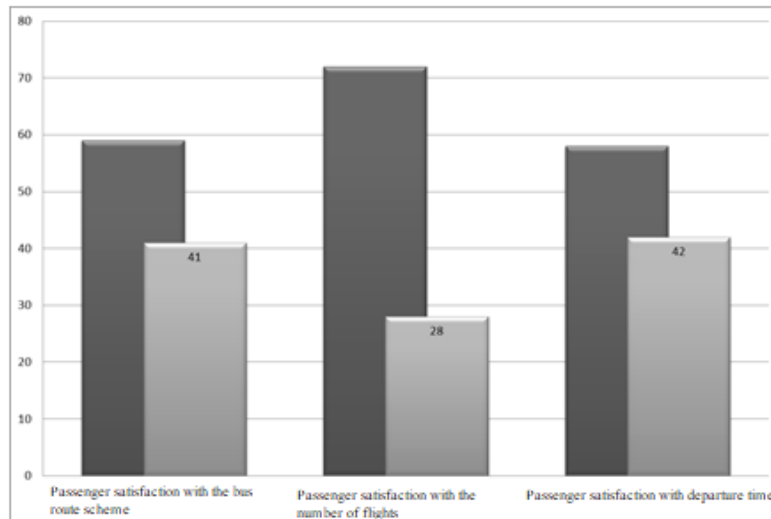
Many respondents noted the convenient location of the Ulyanovsk Central Bus Station (58 %) and the relatively convenient location (42 %). The bus station is located in the center of the city, which is convenient for passengers, but leads to traffic congestion in the city territory.

Overall, most passengers feel comfortable enough at bus stations (70 %) (Figure 2); note convenient location and number of ticket offices, seats in the waiting room (78 %).



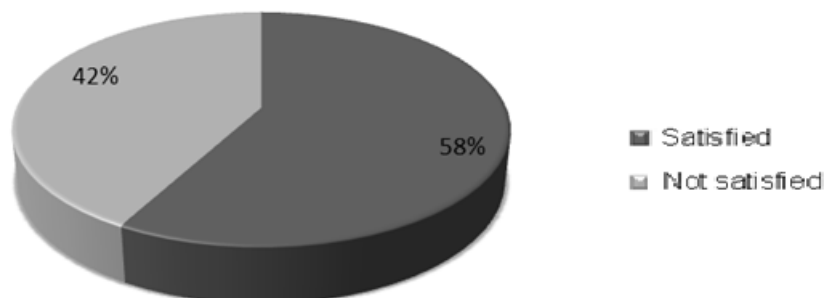
**Figure 2.** Comfort of passengers at bus stations.

59 % of passengers are satisfied with bus routes, 72 % with the number of trips, 58 % with departure times (Figure 3).



**Figure 3.** Timeliness and reliability of passenger transport, %.

Quite a lot of complaints are made by passengers to the safety of transport services. 42 % of passengers have no sense of safety on the trip (Figure 4).



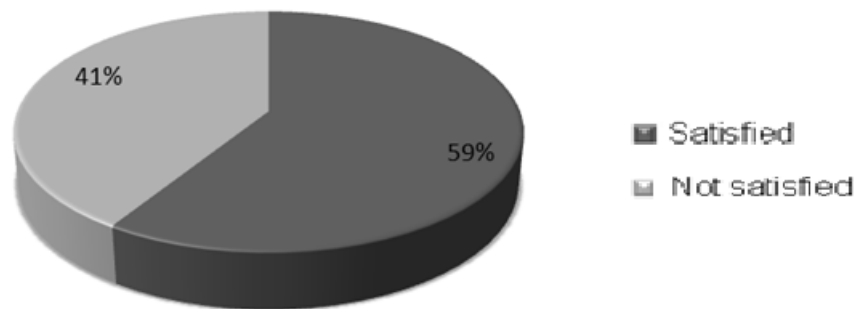
**Figure 4.** Safety of passenger automobile transport services.

Information support of transport services consists in provision of data on routes, schedules, time of departure-arrival at bus stations.

Passengers identify the following sources of information on transport:

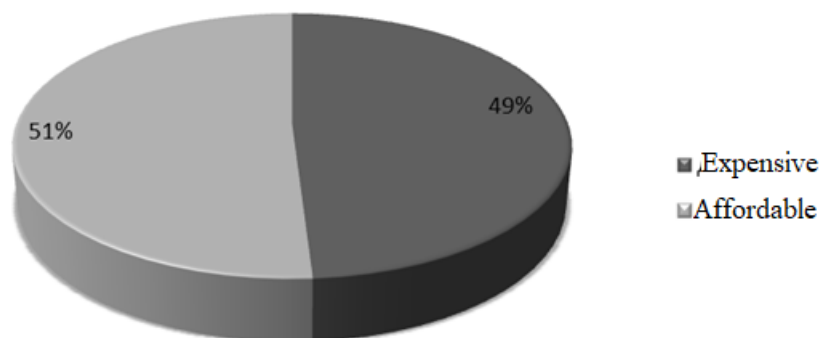
- Own experience of trips – 26 %;
- Social networks – 5 %;
- Bus station website – 14 %;
- Bus station information desk – 24 %;
- stands and electronic boards of bus station – 31 %.

41 % of passengers report a lack of information at bus stations on the schedules of related modes of transport (rail, aviation, urban transport) (Figure 5). The creation of an electronic application to cellular phones, smartphones and other means of communication is a topical issue.



**Figure 5.** In formativeness.

One of the important parameters of transportation is the trip cost of about half of the surveyed passengers is estimated as expensive (49 %), 51 % considered the fares affordable (Figure 6) The system of benefits doesn't exist on interregional passenger automobile transport at all.



**Figure 6.** Satisfaction of passengers with the trip cost.

The quality index, when moving passengers in interregional transport, is a quantitative characteristic of one of the features that make up the quality of passenger transportation, considered in relation to certain conditions of their organization and implementation [10]. Most authors equate the quality of passenger transportation with safety [11–13]. In fact, transport safety requirements are prescribed in all standards related to passenger transport services [3–5]. The indexes that help to assess the quality of transportation include the safety of trip, the time of trip, comfort of waiting time and trip itself, etc.

Expert assessment of the most significant quality indexes of passenger transportation showed such distribution: safety of passenger transport services (A1 – 13.2 %); reliability of transport services (A2 – 12.7 %); timeliness of passenger transportation (A3 – 10.9 %); comfort of passenger transportation (A4 – 11.8 %); service economy (A5 – 9.4 %); in formativeness (A6 – 8.7 %); comfort of passengers at bus stations (A7 – 9 %). Of all the 14 indexes, 7 of them were the most important. They accounted for 80 % of the total number of indexes.

The differential method of estimating the resulting quality level index is to compare concrete unit quality indexes of the estimated service with the corresponding unit quality indicators of the base sample.

The resulting quality level is calculated by:

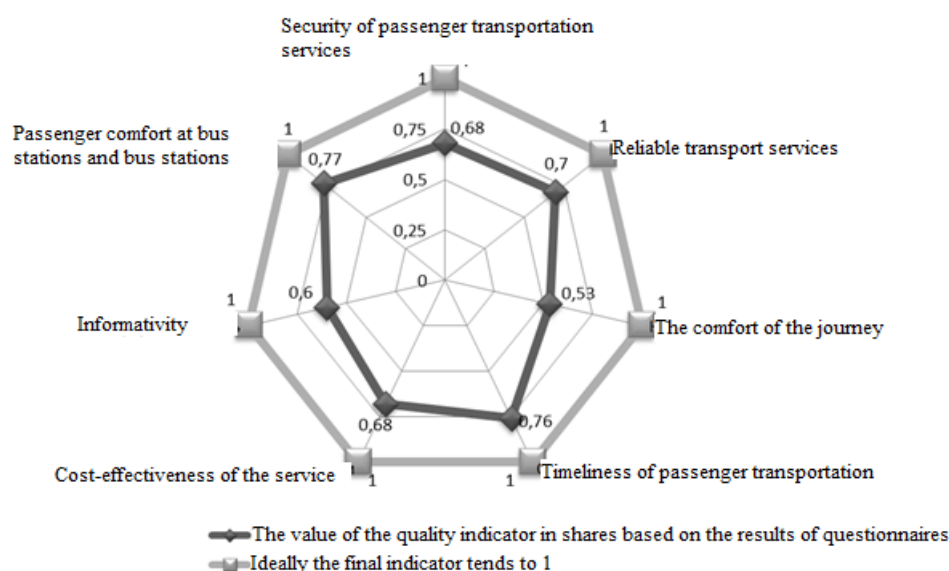
$$S_i = \frac{A_1 + A_2 + A_3 + A_4 + A_5 + A_6 + A_7}{7} \quad (1)$$

Through the allocated answers of passengers to the questionnaire it is proposed to determine the numerical value of each index of the transport quality services of included in the resulting index. The numerical value of each quality index is defined as the average of the numerical values of responses in fractions for several questions of the questionnaire (Table 1).

**Table 1.** Numerical values of transport service quality parameters.

Average value of transport services quality	Value of quality indicator in fractions
1. Safety of passenger transport services	0.68
2. Reliable transport services	0.7
3. Comfort of transportation	0.53
4. Timeliness of passenger transportation	0.76
5. Economy of service	0.68
6. Informativeness	0.6
7. Comfort of passengers at bus stations	0.77

Thus, we will determine the numerical values of each transport quality services index for the transportation of passengers in the interregional communication in the Ulyanovsk region. It can be seen from Table 1 and Figure 7 that all quality indexes require significant improvement.

**Figure 7.** Numerical values of transportation services quality parameters.

The resulting quality level index should be defined as follows:

$$S_i = \frac{0.68 + 0.7 + 0.53 + 0.76 + 0.68 + 0.6 + 0.77}{7} = 0.7$$

If the evaluated service has all the quality indexes  $A_i \geq 1$ , its quality level is higher or equal to the basic; if all  $A_i < 1$ , then the level is lower.

### 3. Conclusion

On the understanding that ideally the final indicator aspires to a unit of  $S_i = 1$ , it can be concluded that the level of quality of interregional passengers automobile transport in the Ulyanovsk region is rather low and needs to develop a set of measures to increase it.

### References

- [1] Gudkov V A, Mirotin A B, Vel'mozhin A V and Shiryayev S A 2004 *Passazhirskie avtomobil'ny'e перевозки* ed V A Gudkova (Moscow: Goryachaya liniya – Telekom) p 448 [In Russian]
- [2] Russian state standard GOST R 51825-2001 2001 *Uslugi passazhirskogo avtomobil'nogo*

- transporta. Obshhie trebovaniya (Moscow: Gosstandart Rossii) p 8 [In Russian]
- [3] Russian state standard GOST R 51006-96 1996 Usługi transportny`e. Terminy` i opredeleniya (Moscow: Gosstandart Rossii) p 12 [In Russian]
- [4] Gorev A E` 2008 *Informacionny`e texnologii v upravlenii logisticheskimi sistemami* (SPb.: SPbGASU) p193 [In Russian]
- [5] Gudkov V A 2012 *Passazhirskie avtomobil`ny`e perezozki: Programma kursa, metodicheskie ukazaniya i zadaniya po vy`polneniyu kursovogo proekta* (Volgograd) p 25 [In Russian]
- [6] Epifanov V V, Obshivalkin M Yu, Lukon`kina K A and Gusev S I 2019 Uluchshenie kachestva transportny`x uslug obshhestvennogo transporta na osnove ocenki trebovanij potrebitelej *Sbornik: Aktual`ny`e voprosy` organizacii avtomobil`ny`x perezozok, bezopasnosti dvizheniya i e`kspluatacii transportny`x sredstv* pp 266–74 [In Russian]
- [7] Sullivan L P 1986 *Quality Progress: 'Quality Funktion Deployment'* vol **6** pp 39–50
- [8] Kieu L M, Bhaskar A and Chung E 2014 Public Transport Travel-Time Variability Definitions and Monitoring *Journal of Transportation Engineering* no **7** pp 122–30
- [9] Zou X and Yue W L 2017 A Bayesian Network Approach to Causation Analysis of Road Accidents Using Netica *Journal of Advanced Transportation* vol **2017** 2525481
- [10] Cai Z, Wang D and Chen X M 2017 A novel trip coverage index for transit accessibility assessment using mobile phone data *Journal of Advanced Transportation* vol **2017** 9754508